PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2000-211485
(43)Date of publication of application : 02.08.2000

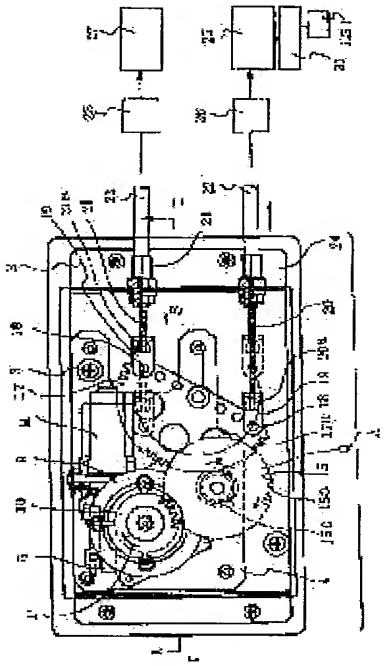
(51)Int.Cl. B60T 7/02
B60T 13/74

(21)Application number : 11-012502
(22)Date of filing : 20.01.1999

(71)Applicant : NIPPON CABLE SYST INC
(72)Inventor : OKAMOTO MOTOSHI
KURAOKA KOJI

(54) ASSIST DEVICE OF PARKING BRAKE

(57)Abstract:
PROBLEM TO BE SOLVED: To provide an assist device of a parking brake smooth in operation even in the case of a manual operation, capable of obtaining sufficient assist force even in the middle of an operation and at the end of the operation and high in mechanical efficiency.
SOLUTION: This assist device A is provided with a transmission lever 17 which is freely rotatably supported in the vicinity of an intermediate position, an operating cable 20 which is freely rotatably connected to one end of the transmission lever 17 and connects the transmission lever 17 and a brake operating lever 25, a driven cable 21 which is freely rotatably connected to the other end of the transmission lever 17 and connects the transmission lever 17 and a center brake 27 for parking and a motor M with a reduction gear G for rotating and driving the transmission lever 17. In this case, an electromagnetic clutch 9 capable of selecting a state that a torque transmission from the motor M side to the transmission lever 17 side is made possible and a state that torque transmission from the transmission lever 17 side to an actuator side is made impossible is provided between the reduction gear G and the transmission lever 17 side. On each of the operating cable 20 and the driven cable 21, pulling force sensors 26, 28 for controlling motor M are provided.



* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1]An assist device of ** characterized by comprising the following.
A transmission lever currently supported in the Nakama neighborhood enabling free rotation.
An operating cable which is connected with an end of the transmission lever, enabling free rotation, and connects between a transmission lever and brakes operation levers.
A follower cable which is connected with the other end of a transmission lever, enabling free rotation, and connects between a transmission lever and parking brakes.
An actuator for rotating said transmission lever.

[Claim 2]The assist device comprising according to claim 1:
A state which can carry out torque transmission to the transmission lever side from the actuator side between said actuator side and the transmission lever side.
A clutch mechanism which can choose the state of making impossible torque transmission from the transmission lever side to the actuator side.

[Claim 3]When a length power sensor is formed in said operating cable and a follower cable, respectively and a length power sensor of an operating cable detects length power more than predetermined, The assist device according to claim 1 provided with a control circuit which stops an actuator when an actuator is made to drive in the direction which lengthens a follower cable and a length power sensor of a follower cable detects length power more than predetermined further.
[Claim 4]The assist device according to claim 2 which is an electromagnetic clutch into which said clutch mechanism has gone torque transmission between an actuator side and the transmission lever side.
[Claim 5]The assist device according to claim 2 which is a one way clutch which transmits torque to the transmission lever side when rotating a transmission lever in the direction which lengthens a follower cable, and becomes free in an opposite direction when said clutch mechanism sees from the actuator side.
[Claim 6]The assist device according to claim 1 with which a pinion which said transmission lever has a circular row of teeth centering on a rotation center, and drives with an actuator to the row of teeth has geared.
[Claim 7]A support member which supports said transmission lever enabling free rotation is provided, enabling free movement in the move direction of a cable, and the direction of abbreviated parallel, and. The assist device according to claim 1 constituted so that a transmission lever may rotate a connecting part of an operating cable as a center, when said actuator drives the support member in the length direction of a cable.
[Claim 8]The assist device according to claim 7 which said support member is a support lever which has a rotation center in an opposite hand of a supporter on both sides of a connecting part of a transmission lever and an operating cable, and is constituted so that said actuator may carry out the rotation drive of the support lever.
[Claim 9]It has a connection lever which connects a driving lever driven with said actuator, and its driving lever and said support lever, The assist device according to claim 8 which constitutes a toggle mechanism so that an angle of the driving lever and connection lever may become close to a straight line when those driving levers, a connection lever, and a support lever rotate in the direction in which a driving lever lengthens a follower cable.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]This invention relates to the assist device of a parking brake. It is related with the assist device used in more detail suitably for the transmission brake (center parking brake) of large-sized cars, such as a car especially a track, and a trailer, etc.
[0002]
[Description of the Prior Art]In large sized vehicles, such as a track, the transmission brake for restraining rotation of a drive shaft mechanically with a file plate is provided behind transmission as a parking brake. Such a transmission brake connects mechanically the brakes operation lever and the brake lever of a transmission brake which were provided in the driver's seat by a cable, and it lengthens and operates a cable, and rotates a brake lever, and he is trying to make a brake action do so by pulling up a control lever. It constitutes so that the push button for ratchet release etc. which the ratchet mechanism of the prevention from reversion was provided in the control lever, and were provided in the upper bed of the control lever may cancel a ratchet.
[0003]By especially large-sized track, since a powerful brake force is required for such a parking brake, large power is required for it in the end of the stroke of a control lever. In order to solve this problem, taking the large lever ratio of a control lever, for example is also considered, but the rotation stroke of a control lever becomes large in that case, and it actually becomes difficult to carry out operation.
[0004]On the other hand, as an assist device of the parking brake of the usual car, there are some which are indicated, for example to JP,6-2848,Y. As shown in drawing 11, this thing cabled the cable 104 connected with the end of the cable 102 from the control lever 101, and the actuator 103 of the motor drive in the shape of parallel, and has connected those ends with the both ends of the balance lever 105. And the central part of the balance lever 105 was connected with the connecting member 106, enabling free rotation, and it connected with the follower side [2] cable 108 with the equalizer 107, and has connected with the brake lever of the wheel 109a.
[0005]Furthermore the relative displacement pilot switch 109 detects inclination of the connecting member 106, and he is trying to make operation by the actuator 103 follow the control input by the control lever 101. The numerals 110 are control circuits. For fail-safe, so that the balance lever 105 can be lengthened and operated only by the control lever 101, He forms the stopper which regulates the angle of the balance lever 105 to below predetermined, and is trying for the head 104a of the cable 104 to escape from and come out from the engaging hole 105a of the balance lever 105 so that the cable 103 by the side of an actuator may not interfere further.
[0006]It is what is fundamentally operated with hand control to JP,6-48290,A, A reaction force switch and a reaction force detector detect the operating condition of a parking brake, and only when a braking state is not enough, the manual operating device of the parking brake which increases the tension of an operating cable is indicated. If the reel divided into the circumference of the drive boss is furthermore formed in JP,6-144211,A, the middle of a brakes operation cable is almost wound around the reel and some tension is applied to a brakes operation cable, The power assisting device using a kind of friction clutch that torque gets across to a reel in friction with a reel and a drive boss is indicated.
[0007]
[Problem(s) to be Solved by the Invention]Since the cable 102 and the connecting member 106 for operation carry out eccentricity of the power assisting device of above-mentioned JP,6-2848,Y and it is arranged, in the case of manual operation, a connecting member cannot be moved smoothly. Since eccentricity is carried out also when operating the connecting member 106 with the actuator 103, a motion is not smooth. Furthermore, since the actuator 103 operates only when the relative displacement (difference of movement magnitude) of the cable 102 by the side of a control lever and the cable 104 by the side of an actuator is more than predetermined, it will stop, if operation of the control lever 101 is overdue, and if too quick, it will become heavy. And since there are some neutral zones when detecting inclination of the balance lever 105, an operating physical force cannot be made to fully reduce in the culmination of operation in which an operating physical force is needed most. Therefore, it is not appropriate to adopt it as center parkings, such as a track.
[0008]When the final braking state of the manual operating device of JP,6-48290,A is insufficient, a brake force can be compensated, but an operating physical force cannot be assisted in the middle of operation. Although there is an advantage which makes a friction clutch generate torque transmission force according to the operating physical force according [the assist device of JP,6-144211,A] to hand control, since a friction part has a slide, efficiency is low.

[0009]The operation of this invention is smooth, it can acquire assist force in the middle of operation sufficient also in the end of operation, and its mechanical efficiency is high, and, also in the case of manual operation, it makes it the technical technical problem to provide the assist device of the parking brake which can be adopted suitably for the transmission brake of a track, etc. Furthermore, this invention makes it the technical technical problem to provide the assist device which can switch manual operation and power assisting operation easily, and can be made to correspond also to operation only by motor operation.
[0010]
[Means for Solving the Problem]This invention is characterized by an assist device of a parking brake comprising the following.
A transmission lever currently supported in the Nakama neighborhood enabling free rotation.
An operating cable which is connected with an end of the transmission lever, enabling free rotation, and connects between a transmission lever and brakes operation levers.
A follower cable which is connected with the other end of a transmission lever, enabling free rotation, and connects between a transmission lever and parking brakes.
An actuator for rotating said transmission lever.

[0011]It is preferred to establish a clutch mechanism which can choose the state where torque transmission can be carried out to the transmission lever side from the actuator side between an actuator side and the transmission lever side in such an assist device, and the state of making impossible torque transmission from the transmission lever side to the actuator side. When a length power sensor is furthermore formed in an operating cable and a follower cable, respectively and a length power sensor of an operating cable detects length power more than predetermined, When an actuator is rotated in the direction which lengthens a follower cable and a length power sensor of a follower cable detects length power more than predetermined further, it is preferred to provide a control circuit which stops an actuator.
[0012]Said clutch mechanism can use torque transmission as an electromagnetic clutch into which it has gone between an actuator side and the transmission lever side. When it sees from the actuator side, when rotating a transmission lever in the direction which lengthens a follower cable, torque can be transmitted to the transmission lever side, and it can also be considered as a one way clutch which becomes free in an opposite direction. Furthermore, a circular row of teeth centering on a rotation center may be provided in a transmission lever, and a pinion driven with an actuator to the row of teeth may be engaged.
[0013]Provide a support member which supports said transmission lever enabling free rotation, enabling free movement in the move direction of a cable, and the direction of abbreviated parallel, and. When said actuator drives the support member in the length direction of a cable, it can constitute so that a transmission lever may rotate a connecting part of an operating cable as a center.
[0014]In that case, it is preferred to use said support member as a support lever which has a rotation center in an opposite hand of a supporter on both sides of a connecting part of a transmission lever and an operating cable, and to constitute said actuator so that the rotation drive of the support lever may be carried out. Provide a connection lever which connects a driving lever furthermore driven with said actuator, and its driving lever and said support lever, and by those driving levers, connection lever, and a support lever. When a driving lever rotates in the direction which lengthens a follower cable, it is preferred to constitute a toggle mechanism so that an angle of the driving lever and connection lever may become close to a straight line.
[0015]
[Function]In the assist device of this invention, since the operating cable and the follower cable are connected with the both ends of the transmission lever in the case of manual operation, if an operating cable is lengthened, a transmission lever can rotate and, thereby, a follower cable can be lengthened. If the power which lengthens an operating cable is loosened, an operating cable can be sent out by the power of the return of a follower cable. Thus, since the operating cable and the follower cable are substantially connected via the transmission lever in the device of this invention, as compared with the case of the connection which carried out eccentricity, a motion is smooth, and mechanical efficiency is high as compared with the torque transmission using friction.
[0016]In the case of assist operation, if an actuator makes a transmission lever rotate, length operation of the follower cable will be carried out according to it. Therefore, as compared with the case where an eccentric drive is carried out, mechanical efficiency is high. Still more sufficient assistance till the end of operation can be received.
[0017]In the assist device which established said clutch mechanism, if an actuator is rotated after changing into the state where torque transmission turns on a transmission lever side from the actuator side, a transmission lever can be rotated, and a follower cable can be lengthened and operated. Thereby, a parking brake can be hung comfortably. On the other hand, when the torque transmission from the transmission lever side to the actuator side changes into an impossible state, the resistance by the side of an actuator is in few states, and manual operation can be carried out easily.
[0018]If brakes operation is begun manually in the case of the assist device which formed the above-mentioned length power sensor, the length power of the operating cable rises. And when the length power more than a value predetermined in the length power sensor of an operating cable is detected, an actuator drives and assist operation begins. Subsequently, since the length power of a follower cable will become large if brakes operation is completed, the length power sensor of a follower cable detects that, and stops an actuator. Thus, in the case of this assist device, it continues that manual operation and the power operation by an actuator are natural.

[0019]When using a clutch mechanism as an electromagnetic clutch, when applying brakes with an actuator, an electromagnetic clutch is turned ON, and when removing a brake, the time of manual operation, etc. turn OFF an electromagnetic clutch by other operating conditions. Thus, in this device, since a transmission lever and the actuator side can be freely connected and cut by control by an electric circuit, various operating patterns, such as a change of the operation and manual operation by an actuator, can be set up comparatively freely.
[0020]Since the torque transmission from the actuator side to the transmission lever side is possible for the case of the assist device which used the clutch mechanism as the one way clutch when making an actuator drive in the direction which applies brakes, brakes can be applied by assist operation. Since the torque transmission from the transmission lever side to the actuator side is impossible when applying brakes by manual operation, it can be operated without being interfered at the actuator side. Since the clutch is a direction in which torque transmission is possible as it is when removing a brake, a clutch is changed into the state in which torque transmission is always impossible by making an opposite direction drive an actuator. Thereby, a brake can be taken off manually.
[0021]Since a slowdown operation can be made to perform also in this portion when providing a circular row of teeth in a transmission lever and engaging with a pinion, a mechanism becomes compact.
[0022]In the state where an actuator is not made to drive in the assist device (claim 7) of the mode which drives the above-mentioned support member, it is in the state where the operating cable and the follower cable were connected via the transmission lever. Therefore, manual operation can be carried out. In the case of an actuator drive, if a support member is moved in the direction which lengthens a cable, a transmission lever can rotate a connecting part with an operating cable as a center, and a follower cable can be lengthened and operated. Since a transmission lever rotates to an opposite direction focusing on a connecting part with an operating cable when making an opposite direction drive an actuator and moving a support member to an opposite direction, the power which lengthens a follower cable can be weakened and a brake is taken off. Thus, in this assist device, manual operation and assist operation can be switched easily, without using a clutch mechanism.
[0023]Since from an actuator to rotation of a transmission lever is performed by transfer of rotational movement in the assist device which used the above-mentioned support member as the support lever which has a rotation center in the opposite hand of a supporter on both sides of the connecting part of a transmission lever and an operating cable, mechanical efficiency is still higher. A large operating physical force can be demonstrated in the device using a toggle mechanism in the end of operation of applying brakes.
[0024]
[Embodiment of the Invention]The embodiment of the assist device of this invention is described referring to drawings next. The top view and drawing 2 which drawing 1 shows one embodiment of the assist device of this invention The II-II line sectional view of drawing 1, The top view and drawing 4 in which the embodiment of everything [drawing 3] but the assist device of this invention is shown The IV-IV line sectional view of drawing 3, The perspective view in which drawing 5 shows the operation explanatory view of the device of drawing 3, and drawing 6 shows one embodiment of the arrangement state of the device of drawing 3, The flow chart of the brakes operation according [the electric diagram, drawing 8, and drawing 9 which drawing 7 shows one embodiment of the control circuit of the device of 6] to the control circuit of drawing 7, The perspective view in which drawing 10 a shows other embodiments of the arrangement state of the device of drawing 3, the electric diagram in which drawing 10 b shows one embodiment of the control circuit of the device of drawing 10 a, drawing 10 c, and drawing 10 d are the flow charts of the brakes operation by the control circuit of drawing 10 b.
[0025]Under the base plate 1, the support plate 2 which leaves a space and is formed on it, and its support plate, assist device A shown in drawing 1 and drawing 2 was hung with the spacer rod 3 etc., was hung, and is provided with the board 4. On the support plate 2, the motor M with reduction-gears G is attached. The motor with these reduction gears is an actuator of claim 1. Furthermore, the box-like covering 5 is put on the circumference of the support plate 2 including the motor M. The motor M is a direct-current motor which can rotate in both directions, and, as for the reduction gears G, a worm reducer is used.
[0026]As shown in drawing 2, the output shaft 7 of the reduction gears G is penetrated under the support plate 2, and the shaft 8 is connected with the output shaft 7 so that torque transmission is possible. It hangs and the electromagnetic clutch 9 which uses the shaft 8 as an input shaft is attached on the board 4. Furthermore, the 1st gear 10 was formed in the circumference of the shaft 8, enabling free rotation, and the 1st gear 10 equips it with the gear part 10b of the byway from the disc-like holding part 10a fixed to the output rotation board 11 of the electromagnetic clutch 7 with the screw 12, and it.
[0027]The idler gear 15 is formed in the circumference of the 1st fixed shaft 14 that hung with the support plate 2 and was fixed between the boards 4, enabling free rotation. The idler gear 15 has the major-diameter gear 15a and the byway gear 15b. The major-diameter gear 15a has geared with the gear part 10b of the 1st gear 10. The transmission lever 17 is formed in the circumference of the 2nd fixed shaft 16 that furthermore hung with the support plate 2 and was fixed between the boards 4, enabling free rotation. The transmission lever 17 has a semicircular state gestalt, as shown in drawing 1, and the row of teeth 17a which gears with the byway gear 15b of the idler gear 15 is formed in the circular periphery.
[0028]The U character-like connecting member 19 is attached to the both ends of the transmission lever 17 via the pin 18, respectively, enabling free rotation.
The cable ends 20a and 21a fixed to the end of the operating cable 20 and the follower cable 21 are engaging with those connecting members 19, respectively.
The operating cable 20 and the follower cable 21 are pull cables which transmit the power of the length direction,

and what has the flexibility which twisted several metal wires is used. Those cables 20 and 21 are guided with the lead pipes 22 and 23, enabling free sliding.
The end of each lead pipes 22 and 23 is connected with the side attachment wall of the support plate 2 via the publicly known cable cap 24.
As the lead pipes 22 and 23, a metal wire is usually coiled spirally and what has the flexibility which covered the synthetic resin is used. However, it may not have the flexibility of a metallic pipe etc.
[0029]The operating cable 20 and its lead pipe 22 are connected with the brakes operation lever 25 side.
The length power sensor 26 which detects the length power of the operating cable 20 to the middle is formed.
The follower cable 21 and its lead pipe 24 are connected with the transmission brake 27.
The length power sensor 28 which detects the length power of the follower cable 21 to the middle is formed.
Although each length power sensors 26 and 28 detect the size of length power as a numerical value, when a predetermined preset value is exceeded, they are used as the sensor of the switch type which takes out a contact signal etc. here.
[0030]The brakes operation lever 25 should just be a lever for operation of the parking brake of a conventionally publicly known car, for example, the control lever of the manual type formed to the bracket attached to the floor line as shown in drawing 6 enabling free rotation is used. However, they may be a lever of a step type, a lever of the type pulled out by a hand, etc. To the operating cable 20, those control levers are connected so that length operation can be performed. It has the ratchet mechanism 31 so that the state where lengthened the operating cable 20 and brakes were applied can be maintained.
[0031]The ratchet mechanism 31 comprises the ratchet claw 32 formed in the control lever 25 enabling free rotation, and the ratchet tooth train 33 which gears with the ratchet claw. Furthermore, the rod 34 for ratchet release is formed in the control lever 25. In the lever of a step type, there are some which provided the lever for ratchet release separately, and there are some which make one way rotate the control lever, validate a ratchet, rotate an opposite direction, and carry out ratchet release in the control lever of the type pulled out by hand. The numerals EN in drawing 6 are engines, numerals TM is transmission, the numerals 27 are transmission brakes, and numerals DS is a drive shaft. In this embodiment, limit switch LS1 which detects that the ratchet claw 32 for control-lever 25 is in a released state is provided.
[0032]In assist device A constituted like the above, while changing the electromagnetic clutch 9 of drawing 1 into the state of the "end", the transmission lever 17 is separated from the motor M side. Therefore, the operating cable 20 and the follower cable 21 are the same as being directly connected via the transmission lever 17. Therefore, if the control lever 25 is lengthened and the operating cable 20 is lengthened and operated, the follower cable 21 will be pulled and the operation which applies brakes to the transmission brake 27 will be done so. Conversely, since the length power of the follower cable 21 can weaken if the control lever 25 is loosened after canceling a ratchet mechanism, a brake action is canceled by operation of the return spring by the side of the transmission brake 27.
[0033]On the other hand, the electromagnetic clutch 9 cannot operate the control lever 25 freely by manual operation in the state of "entering." In that case, when one way was made to rotate the motor M, after slowing down with the reduction gears G, the shaft 8 and the 1st gear 10 rotate in the direction of arrow P. Therefore, the transmission lever 17 rotates in the direction of arrow Q via the idler gear 15. Thereby, length operation of the follower cable 21 is carried out in the direction of arrow S. Since the major-diameter gear 15a of the idler gear 15 has more numbers of teeth then than the gear part 10b of the 1st gear 10 and the effective radius of the transmission lever 17 is larger than the byway gear 15 of the idler gear 15, it slows down in order. Therefore, the follower cable 21 can be lengthened by quite strong power. Since the operating cable 20 loosens at this time, the control lever 25 can be operated according to that speed.
[0034]Although the operation and release operation which apply brakes can be carried out having entered and operating an electromagnetic clutch as mentioned above, At this embodiment, it is made to perform timing of the end [enter] of an electromagnetic clutch by detection of length power sensor [of a cable] 26 and 28, and limit switch LS1 semi-automatically. That is, the length power sensor 26 of the operating cable 20 is set to ON when the length power of 7 or more kgf is detected, for example, and it is made to make the normal rotation direction which lengthens a follower cable rotate the motor M. And when limit switch LS1 detects further that the ratchet mechanism was canceled, the electromagnetic clutch 9 serves as "entering" and it is made for the motor M to rotate in the direction which lengthens a follower cable. The length power sensor 28 of a follower cable is set to ON by larger power, for example, the power of about 100 kgf, than an operating cable, and he is trying to cut the electromagnetic clutch 9.
[0035]From the above-mentioned thing, the whole operation of the transmission brake 27 is as follows.
[Length operation] The control lever 25 is lengthened without canceling (1) ratchet. Since a ratchet is not the engagement direction, it can lengthen as it is. Since the electromagnetic clutch 9 is the "end" until the operating cable 20 reaches predetermined length power, the follower cable 21 will be lengthened by manual operation.
[0036](2) If the length power of the operating cable 20 reaches a predetermined value, the electromagnetic clutch 9 can become "entering", the motor M can rotate, and the follower cable 21 can be lengthened by motor operation. Therefore, those who operate it should just lengthen the control lever 25 by the grade which only takes the slack of the operating cable 20.
[0037](3) Since it means that the parking brake was hung firmly when the length power of the follower cable 21 reaches a predetermined value, suspend the motor M. The control lever 25 is lengthened to such an extent that it applies some tension to the operating cable 20, and it makes the ratchet mechanism 31 then engaged. Thereby, a

brake force is maintained.
[0038][Maintenance operation] In addition, although the electromagnetic clutch 9 is in the state of "entering" in this state, when the engine is turned off, it may be made to become the "end", and is a priori good as for the "end" with a timer or a separate switch. The electromagnetic clutch 9 is made into always "entering", and when an operation of a parking brake becomes weak by a certain cause, it operates the motor M again automatically and it may be made to recover a predetermined brake force furthermore.
[0039][Return operation] Engagement of the ratchet mechanism 31 is canceled lengthening the control lever 25 partly. Since the electromagnetic clutch 9 will be in the state of the "end" by that cause, the control lever 25 is returned by manual operation as it is to the original state (state parallel to a floor line in the case of drawing 6). Since the load of the follower cable 21 decreases promptly, a parking-brake operation is canceled. When the electromagnetic clutch 9 is in the state of "entering", the length power of the transmission lever 17 which is held at the actuator of a halt condition, holds the great portion of length power of the follower cable 21, and is applied to the operating cable 20 is weak. Therefore, a ratchet can be removed easily and a parking-brake operation can be canceled comfortably.
[0040]Although the electromagnetic clutch is adopted as a clutch in the above-mentioned embodiment, a one way clutch is also employable. In that case, when it sees from the motor M side (shaft 8 side), when rotating the motor M in the direction which lengthens a follower cable, torque is transmitted to the 1st gear 10 side, and direction of a one way clutch is set up in an opposite direction become free. The length power sensors 26 and 28 are used in order to rotate the motor M. Also with limit switch LS1, it is considered as the conditions of rotation of the motor M. The operation of this embodiment is as follows.
[0041][Length operation] The control lever 25 is lengthened without canceling (1) ratchet. Since a one way clutch will be rotation of a free direction if it sees from the 1st gear 10 side, the control lever 25 can be lengthened as it is. The motor M will not rotate but the follower cable 21 will be lengthened by manual operation until the operating cable 20 reaches predetermined length power also in this case.
[0042](2) If the length power of the operating cable 20 reaches a predetermined value, the motor M will rotate in the direction which lengthens a follower cable. At this time, torque is transmitted to the 1st gear side from the motor side. Thereby, the follower cable 21 can be lengthened by the motor operation by the motor M.
[0043](3) Since it means that the parking brake was hung firmly when the length power of the follower cable 21 reaches a predetermined value, suspend the motor M.
[0044][Maintenance operation] The one way clutch is a locked position by the reaction force of the follower cable then, and a brake force is maintained. The control lever 25 is lengthened to such an extent that it applies some tension to the operating cable 20, and it makes the ratchet mechanism 31 engaged. Also in the case of this embodiment, when an operation of a parking brake becomes weak by a certain cause, the motor M is operated again automatically and a predetermined brake force can be recovered.
[0045][Return operation] Engagement of the ratchet mechanism 31 is canceled lengthening the control lever 25 partly. Subsequently, counterrotation (it rotates in the direction which lengthens an operating cable) of the motor M is carried out. Thereby, since a one way clutch will be in a free state, the control lever 25 can be returned to the original state by manual operation. Since the load of the follower cable 21 decreases promptly, a parking-brake operation is canceled. When it is in the state which the motor M has stopped, the transmission lever 17 is held at the actuator of a halt condition, and holds the great portion of length power of the follower cable 21.
The length power concerning the operating cable 20 is weak.
Therefore, a ratchet can be removed easily and a parking-brake operation can be canceled comfortably.
[0046]With reference to drawing 3 - 10, other embodiments of an assist device are described below. A clutch mechanism is not adopted but the rotation center of transmission lever 17 ** consists of assist device B shown in drawing 3 and drawing 4, enabling free movement in the length direction of a cable. Namely, in this embodiment, are supporting the central part of the transmission lever 17 at the end of the L character-like support lever 40, enabling free rotation, and the central part (L character-like corner part) of the support lever 40, It is provided in the circumference of the 1st fixed shaft 41 that hangs with the covering 5 which serves as a support plate, and is held between the boards 4, enabling free rotation. And the end of the operating cable 20 is connected between the rotation center of the support lever 40, and the supporter of the transmission lever 17, enabling free rotation.
[0047]The semicircular state driving lever 43 is formed in the circumference of the 2nd fixed shaft 42 furthermore established near the reduction gears G, enabling free rotation.
The row of teeth 43a provided in the circular periphery has geared with the row of teeth formed in the output shaft 7 of the reduction gears G.
And the other end of the connecting linkage 44 connected with one end of the driving lever 43 enabling free rotation is connected with the other end of said support lever 40, enabling free rotation. Engagement of the output shaft 7 and the driving lever 43 does a slowdown operation so. Although the hierarchical order of the output shaft 7, the driving lever 43, the connecting linkage 44, the support lever 40, and the transmission lever 17 is shown in drawing 2, each lever length is deformed.
[0048]About the operating cable 20 connected with the both ends of the aforementioned transmission lever 17 enabling free rotation and the follower cables 21, and those lead pipes 22 and 23, since it is substantially [as assist device A of above-mentioned drawing 1] the same, the same numerals are attached and explanation is omitted.
[0049]Assist device B constituted as mentioned above cannot make it rotate from the outside in a self-restricted operation of the reduction gears G, when the motor M has stopped. Therefore, the support lever 40 is restrained via

the connecting linkage 44 and the driving lever 43, and is not rotated. Therefore, the operating cable 20 and the follower cable 21 are substantially [as the case where it is connected directly mechanically] equivalent, can apply parking brakes by the usual manual operation, and can cancel them.
[0050]That is, if a brakes operation lever is lengthened and the operating cable 20 is lengthened and operated, the transmission lever 17 can rotate like a fictitious outline, and the follower cable 21 can be lengthened and operated. On the other hand, since the length power of the follower cable 21 will also become weaker if a control lever is returned and the length power of the operating cable 20 is weakened, a transmission brake takes off a brake promptly by the energizing force of a return spring.
[0051]On the other hand, when applying brakes with the driving force of the motor M, the motor M is driven so that the clockwise rotation (arrow P) of drawing 5 may be made to rotate the output shaft 7 of the reduction gears G. Thereby, it rotates counterclockwise and the driving lever 43 rotates the support lever 40 counterclockwise via the connecting linkage 44. The rotation center of the transmission lever 17 is pulled in the arrow R1 direction by that cause, and the transmission lever 17 is rotated in the direction of arrow Q focusing on a connecting part with the operating cable 20. Therefore, the follower cable 21 is also pulled in the arrow R1 direction, and brakes operation is performed. During the above-mentioned operation, since the control lever is stopped by the ratchet mechanism, the operating cable 20 is not operated in a returning direction. The 1st fixed shaft 14 and the driving lever 43 which are the supporting points of the driving lever 43, the hinged joint of the connecting linkage 44, and the hinged joint of the connecting linkage 44 and the support lever 40 are located in a line in the state near a straight line in the end of the operation which lengthens the follower cable 21. Thus, since the driving lever 43 and the connecting linkage 44 constitute what is called a toggle mechanism, the torque which restrains the support lever 40 becomes large, and they can apply parking brakes by strong power.
[0052]When taking off a brake, the above and an opposite direction (counterclockwise rotation) are made to rotate the motor M. If it does so, the support lever 40 will rotate clockwise and will weaken the power which lengthens the follower cable 21. Thereby, a parking brake is canceled. About the operating cable 20, it is not operated at all and does not move in the meantime, either.
[0053]The above-mentioned assist device B is arranged in the side member 46 of the section U shape of a car like drawing 6. The lead pipe 22 of the operating cable 20 results in the lower part of a driver's seat through the inside of the side member 46, rises upward from there, and is fixed to the bracket 47 of the brakes operation lever 25 neighborhood of a parking brake. The end of the operating cable 20 is connected with the control lever 25. The control lever 25 is attached to the circumference of a horizontal axis to the bracket (not shown) attached to the floor line of a cab in the lower end neighborhood, enabling free rotation. Like the above-mentioned case, the ratchet tooth train 33 attached to the ratchet claw [which is formed in the control lever 25] 32 and body side is free, when causing the control lever 25, and it is direction which a ratchet stops towards returning. The inner package of the axial movement of the rod 34 for ratchet release is made free to the control lever 25.
The tip is made into the gestalt of a push button.

[0054]Limit switch LS1 which detects a ratchet released state is provided near the ratchet claw 32.
Furthermore by this embodiment, limit switch LS2 which detects whether it is the state which lengthened the operating cable 25 is attached to the floor line.

[0055]the lead pipe 23 of a follower cable is fixed to the case of the transmission brake 27, and the end of the follower cable is connected with the brake lever (not shown) of the transmission brake 27 -- it is.
[0056]Drawing 7 is a circuit diagram showing the control circuit of this assist device B. In this embodiment, it differs from assist device A of drawing 1 so that it may understand from this circuit diagram, The encoder 50 which detects the rotation angle of a driving lever is adopted not using the sensor which detects the length power of a cable, The detection value is integrated by flip-flop counter FF, and he sends to the motor control circuit 51, and is trying to take out the signal of normal rotation, an inversion, and a stop of a motor with the motor control circuit 51. The encoder 50 consists of a point of contact provided in the signal substrate 50a, the brush 50b formed in the driving lever, etc. The numerals 52 are the bridged circuits for normal rotation and an inversion / short circuit (regenerative brake). The numerals 53 are the signal wires for sending a scram signal to the motor control circuit 51, when the encoder 50 detects what the driving lever overran in the direction to which parking brakes are applied. The numerals 54 are the signal wires for sending a scram signal to the motor control circuit 51, when a driving lever similarly overruns in a brake releasing direction.
[0057]The numerals 56 of drawing 7 are 24-volt batteries currently used as a power supply of a car, and the numerals 57 are the regulators for decompressing to 5 volts. LS1 is a limit switch for the above-mentioned ratchet release detection, and the output is sent to the motor control circuit 51 with the signal wire 58 which sends a motor drive inhibiting signal. Furthermore, numerals LS2 is a limit switch for operation detection of an operating cable, and the output is sent to the control circuit 51 with the signal wire 59 which sends a parking-brake start / release signal. It is placed between the 24-volt power lines 60 which drive the motor M by the overload current detecting circuit 61. This circuit detects that overload current flowed into the motor, when brakes are fully applied, or when abnormalities arise on a follower cable etc. The numerals 62 are the timers for sending a signal to the motor control circuit 51, when predetermined time has passed, since the overload current begins to flow.
[0058]The sensor 63 which detects the vehicle speed or acceleration separately is formed, when a brake loosens, the new start of the motor M may be carried out, or it may be made to make the set period of a timer extend. It is a

green LED lamp which indicates that brakes operation completed the numerals 64, and the numerals 65 are the red LED lamps for indicating that overrun arose in the brake action.
[0059]The operation to which brakes are applied by the control circuit constituted as mentioned above is explained referring to the flow chart of drawing 8.
[Length operation] It is checked that the ratchet is not canceled probably (Step S1). Subsequently, if the control lever is caused in the state where the ratchet is not canceled, limit switch LS2 which detects the operating condition of a cable will switch from OFF to ON (Step S2). In the meantime, it can switch only, for example by a part for one gear tooth of a ratchet (first latch). However, it can switch, after rotating by ****.
[0060]By detection of limit switch LS2, the motor M is rotated normally (Step S3). In that case, although the operating cable 20 is also pulled via the transmission lever 17 of drawing 3, since the control lever 25 is not returned by engagement of a ratchet, length operation only of the follower cable 21 is carried out like drawing 5.
Subsequently, when a parking brake did not overrun, or it always detects (step S4) and an encoder detects, the scram of the motor is carried out promptly (Step S5). Red LED for an unusual alarm display is made to turn on still more nearly simultaneous (Step S6).
[0061]If the motor M rotates normally, a follower cable is lengthened and operated and sufficient tension for a follower cable occurs, an over-current will flow into the motor M. And the motor M will be stopped if it detects that the over-current flowed by the timer 62 beyond in predetermined time (Step S7) (Step S8). It indicates that the work to which parking brakes are applied simultaneously was completed by making green LED turn on (step S9).
[0062][Return operation] When taking off a brake, the ratchet of the control lever 25 is canceled and some are returned. The motor M will be reversed if limit switch LS2 for cable operation detection detects that (Step S10 of drawing 9) (Step S11). The power which lengthens a follower cable by that cause can weaken, and a parking brake is canceled. The encoder always detects whether a driving lever overruns (Step S12), when overrun arises, the scram of the motor M is carried out (Step S13), and red LED of an unusual alarm display is made to turn on (Step S14).
[0063]In the state where the motor M is reversed, when an encoder detects a predetermined pulse number (Step S15) and reaches the predetermined number of steps, the motor M is stopped (Step S16). Green LED is made to switch off in order to display brake release then (Step S17).
[0064]In the case of the assist device provided with the speed or the acceleration sensor of drawing 7, if it is detected that some cars moved with the velocity sensor or acceleration sensor of the car where parking brakes finish being applied, the motor M will be normally rotated immediately by making a timer value extend etc. By that cause, a follower cable is lengthened further, and is operated, and brakes are applied too much.
[0065]Although the above-mentioned operation explained the case where a control lever was caused in the state where a ratchet is not canceled, the control lever 25 is caused by manual operation, pushing in the rod (numerals 34 of drawing 6) of which a ratchet is canceled, a rod is detached on the way, and it may be made to make a ratchet engaged. In that case, the motor M rotates and it is begun to lengthen the follower cable 21, after a ratchet is set to ON. Thus, according to this embodiment, the pattern which is electric and performs the whole operation mostly, and the pattern which carries out manual operation to the middle can be chosen by the method of operation of a control lever.
[0066]With reference to drawing 10 a - 10c, other embodiments of the control method of drawing 3 - assist device B of four are described below. As shown in drawing 10 a, in this embodiment, the limit switch which detects the released state of a ratchet mechanism was not formed, but motor operation switch SW1 which replaces with it and consists of change over switches is provided. This motor operation switch SW is formed in the same position as limit switch LS1 in the circuit of drawing 7, as shown in drawing 10 b, it chooses the signal wire 64 which sends an electric start signal, and the signal wire 65 which sends an electric release signal, and is sent to the motor control circuit 51. Furthermore, numerals SW2 is a manually-operated switch, can use the same thing as the above-mentioned limit switch LS1 substantially, and provides it in the same position like drawing 10 b even in a control circuit. The output is sent to the motor control circuit 51 with the signal wire 59 which sends a parking-brake start / release signal.
[0067]In the assist device provided with this control circuit, as shown in the flow chart of drawing 10 c, when ON/OFF of manually-operated switch SW2 is detected first (Step S21) and the control lever 25 is operated, it shifts to the following step. And if the motor operation switch SW is switched to the signal wire 64 of an electric start from the signal wire 65 of electric release (Step S22), the motor M will begin normal rotation. It is the same as the case of drawing 8 after that. If motor operation switch SW1 is switched to the signal wire 65 of electric release from the signal wire 64 of an electric start as shown in drawing 10 d when returning the control lever 25 (Step S23), the motor M will begin an inversion. It is the same as the case of drawing 9 after that.
[0068]When electric switch SW1 is not switched on the way but the control lever 25 is pulled up as it is in drawing 10 c, the support lever 40 is in the state fixed in the original position, The operating cable 20 is pulled, only a transmission cable can rotate in the direction of arrow Q, the follower cable 21 can be pulled, and parking brakes can be applied by manual operation as it is. If the ratchet of the control lever 25 as well as the usual parking brake is canceled and the operating cable 20 is returned when canceling by manual operation, the transmission lever 17 can rotate to the arrow Q and a counter direction, the follower cable 21 can return, and a parking brake can be canceled.
[0069]Also in assist device B of drawing 3, the sensor which detects the length power of a cable like the case of drawing 1 can be adopted, and a motor can be controlled. Also in assist device A of drawing 1, the control circuit of drawing 7 is employable.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1]It is a top view showing one embodiment of the assist device of this invention.
[Drawing 2]It is an II-II line sectional view of drawing 1.
[Drawing 3]It is a top view showing other embodiments of the assist device of this invention.
[Drawing 4]It is an IV-IV line sectional view of drawing 3.
[Drawing 5]It is an operation explanatory view of the device of drawing 3.
[Drawing 6]It is a perspective view showing one embodiment of the arrangement state of the device of drawing 3.
[Drawing 7]It is an electric diagram showing one embodiment of the control circuit of the device of drawing 6.
[Drawing 8]It is a flow chart of the brakes operation by the control circuit of drawing 7.
[Drawing 9]It is a flow chart of the brake release operation by the control circuit of drawing 7.
[Drawing 10]The perspective view in which drawing 10 a shows other embodiments of the arrangement state of the device of drawing 3, the electric diagram in which drawing 10 b shows one embodiment of the control circuit of the device of drawing 10 a, drawing 10 c, and drawing 10 d are the flow charts of the brakes operation and brake release operation by the control circuit of drawing 10 b, respectively.
[Drawing 11]It is a top view showing an example of the assist device of the conventional parking brake.
[Description of Notations]
A Assist device
1 Base plate
2 Support plate
3 Spacer rod
4 Hang and it is a board.
G Reduction gears
M Motor
5 Covering
7 Output shaft
8 Shaft
9 Electromagnetic clutch
10 The 1st gear
14 The 1st fixed shaft
15 Idler gear
16 The 2nd fixed shaft
17 Transmission lever
20 Operating cable
21 Follower cable
22 and 23 Lead pipe
24 Cable cap
25 Control lever
26 and 28 Length power sensor
27 Transmission brake
31 Ratchet mechanism
34 Rod
EN Engine
TM Transmission
DS Drive shaft
LS1 Limit switch
40 Support lever
43 Driving lever
44 Connecting linkage
50 Encoder
51 Motor control circuit
56 Battery
57 Regulator

61 Overload current detecting circuit
62 Timer
63 The vehicle speed / acceleration sensor
64 Red LED
65 Green LED

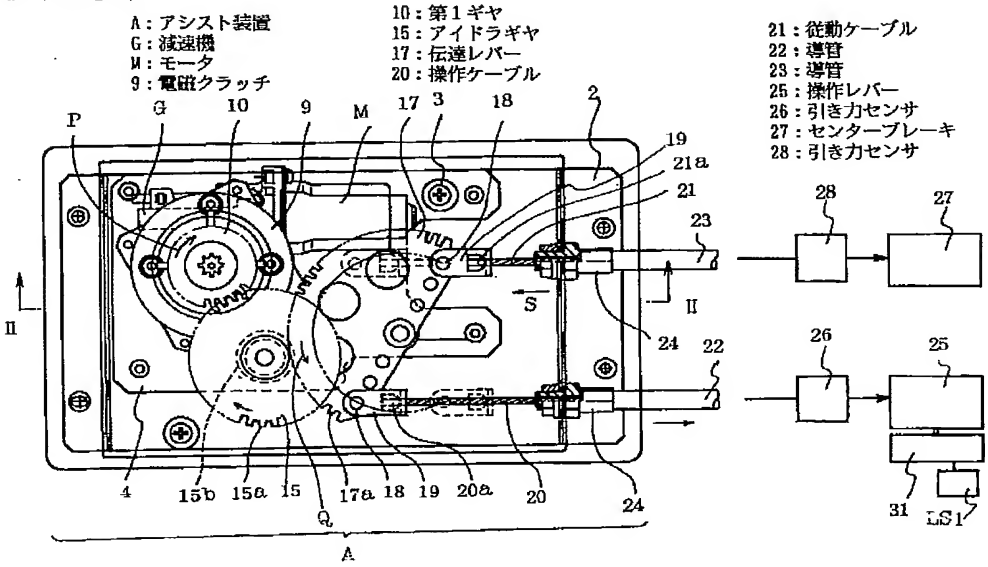
[Translation done.]

* NOTICES *

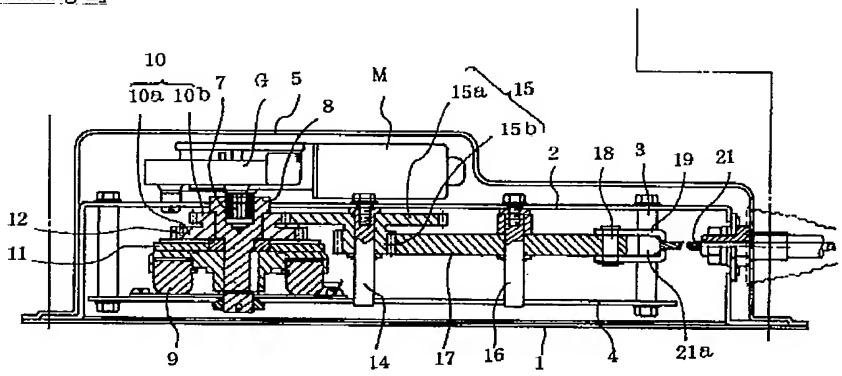
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

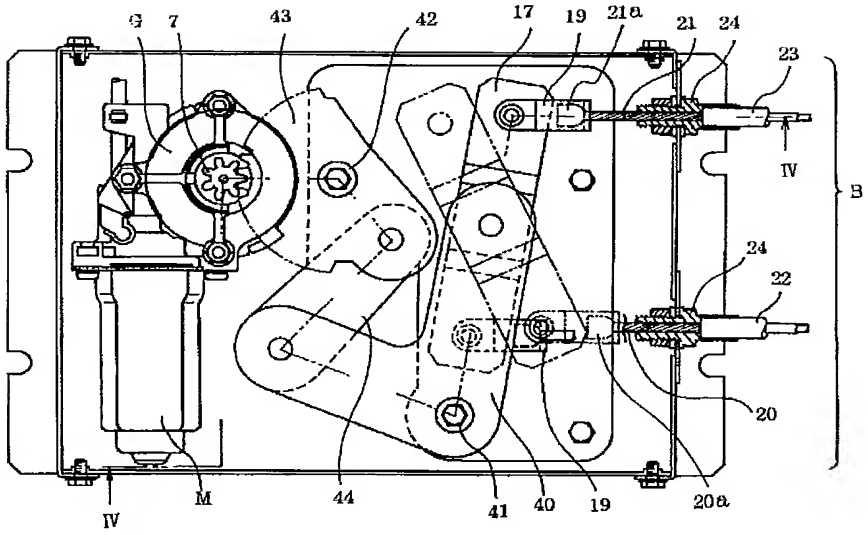
[Drawing 1]



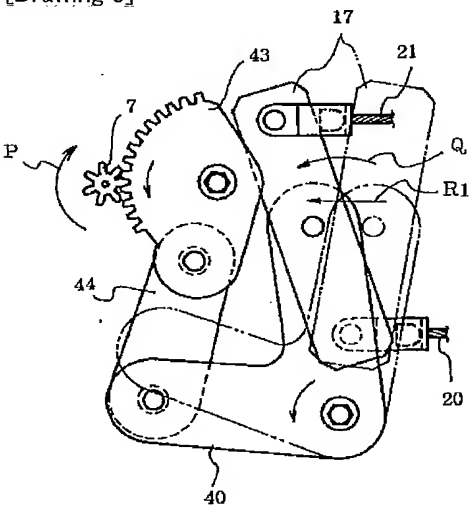
[Drawing 2]



[Drawing 3]



[Drawing 5]



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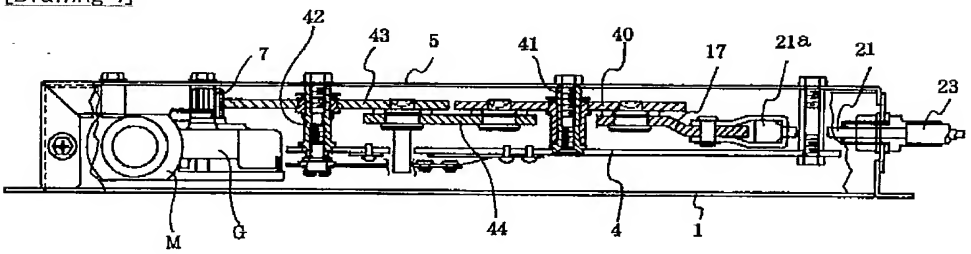
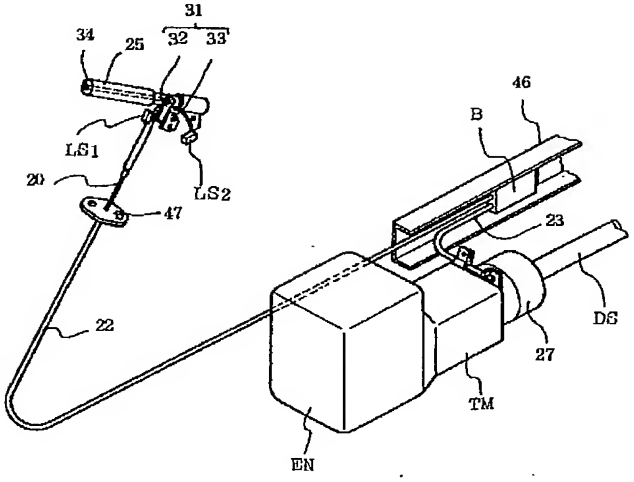
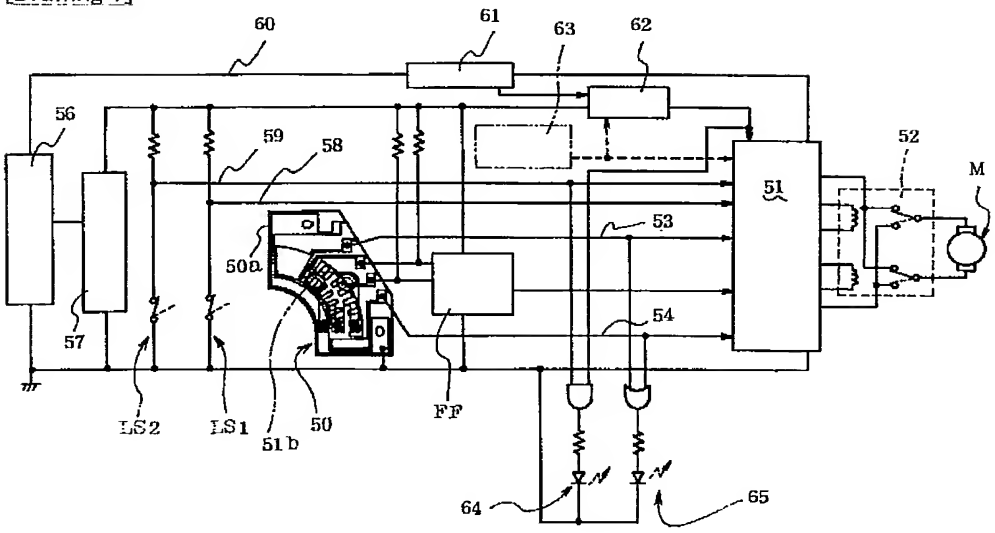


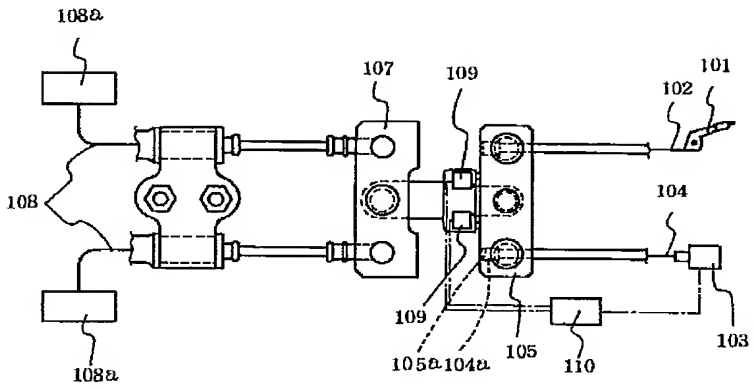
[Drawing 6]



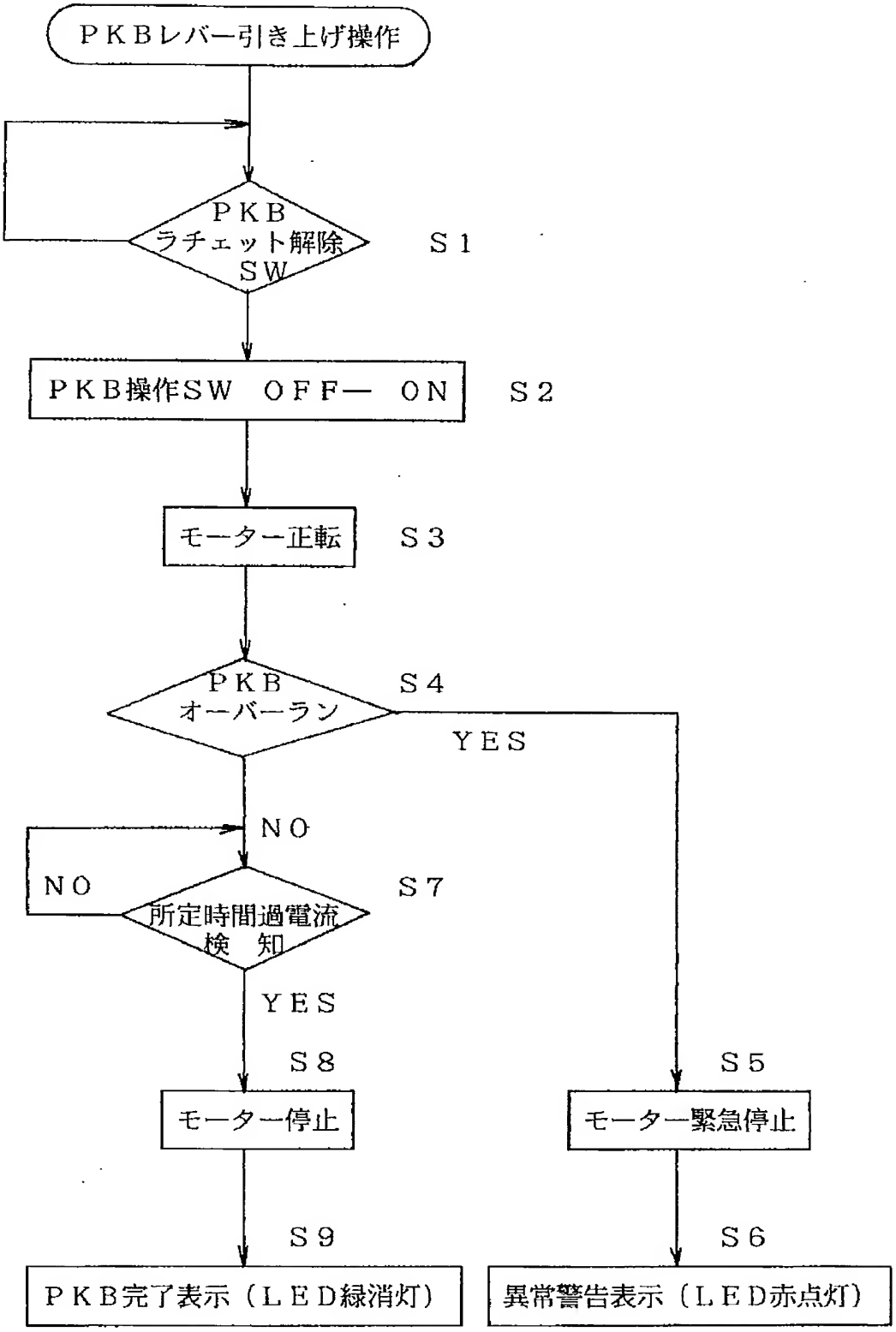
[Drawing 7]



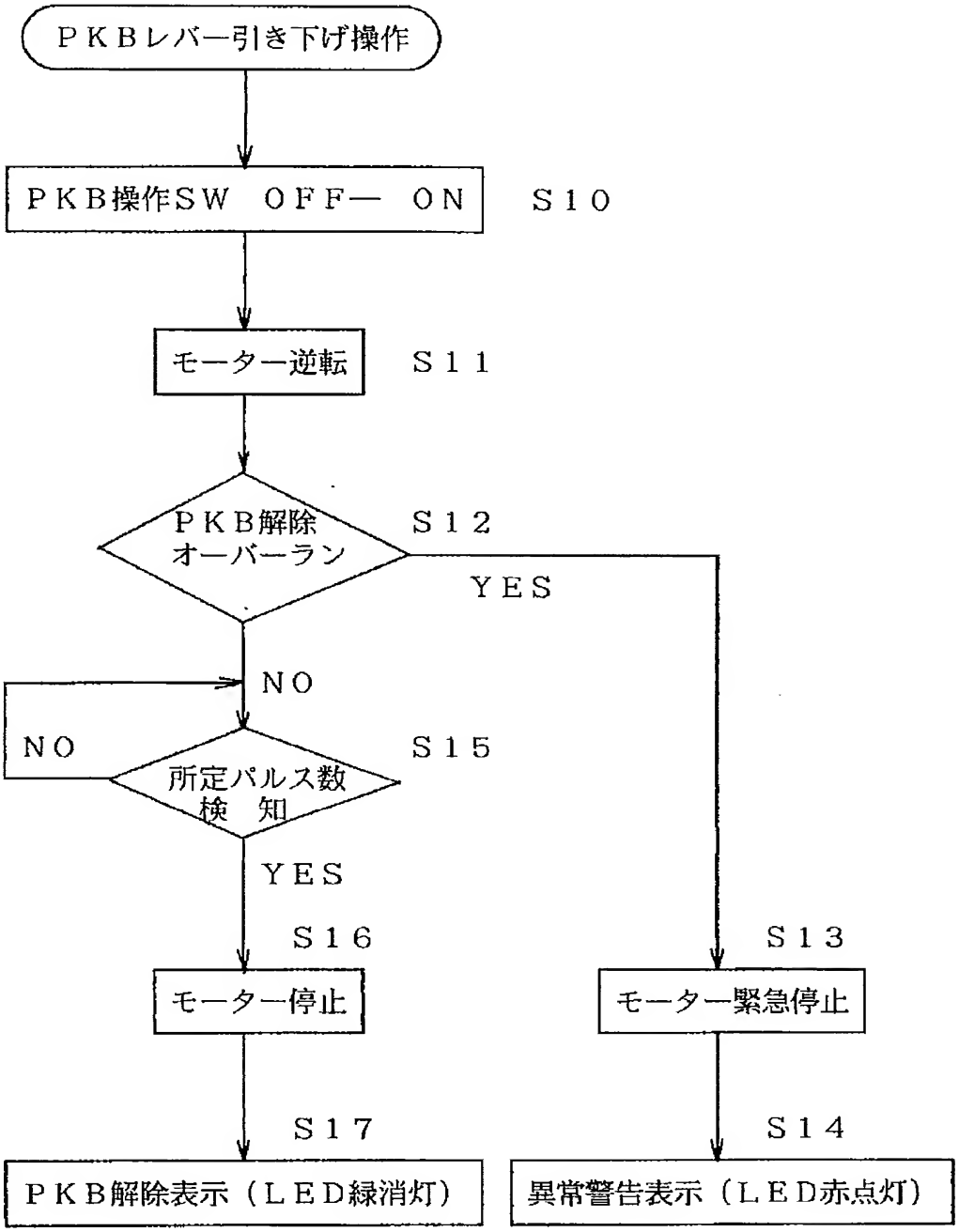
[Drawing 11]



[Drawing 8]

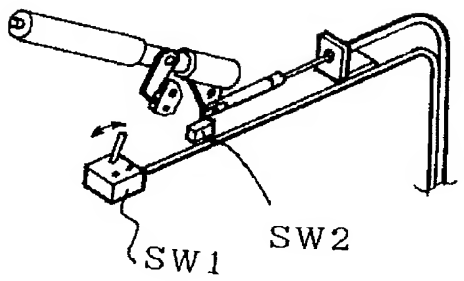

ＰＫＢレバー引き上げ操作
ＰＫＢ
ラチェット解除
ＳＷ
Ｓ１
ＰＫＢ操作ＳＷ　ＯＦＦ—　ＯＮ
Ｓ２
モーター正転
Ｓ３
ＰＫＢ
オーバーラン
Ｓ４
ＹＥＳ
ＮＯ
ＮＯ
所定時間過電流
検　知
Ｓ７
ＹＥＳ
Ｓ８
モーター停止
Ｓ５
モーター緊急停止
Ｓ９
ＰＫＢ完了表示（ＬＥＤ緑消灯）
Ｓ６
異常警告表示（ＬＥＤ赤点灯）

[Drawing 9]


ＰＫＢレバー引き下げ操作
ＰＫＢ操作ＳＷ　ＯＦＦ—　ＯＮ
Ｓ１０
モーター逆転
Ｓ１１
ＰＫＢ解除
オーバーラン
Ｓ１２
ＹＥＳ
ＮＯ
ＮＯ
所定パルス数
検　知
Ｓ１５
ＹＥＳ
Ｓ１６
モーター停止
Ｓ１３
モーター緊急停止
Ｓ１７
Ｓ１４
ＰＫＢ解除表示（ＬＥＤ緑消灯）
異常警告表示（ＬＥＤ赤点灯）

[Drawing 10]

(a)



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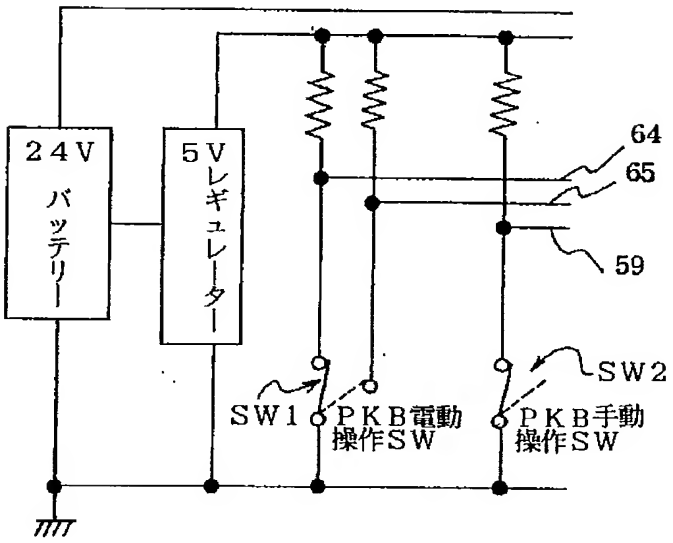
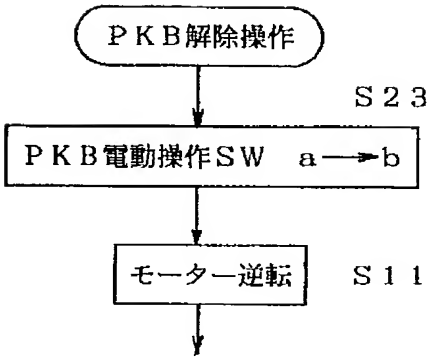
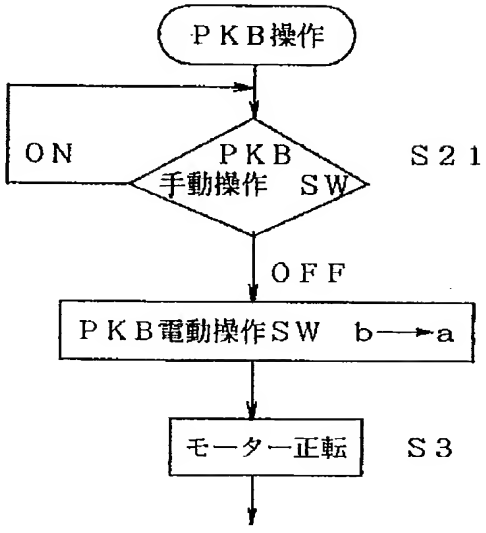


(c)



(d)



[Translation done.]